

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
17 March 2005 (17.03.2005)

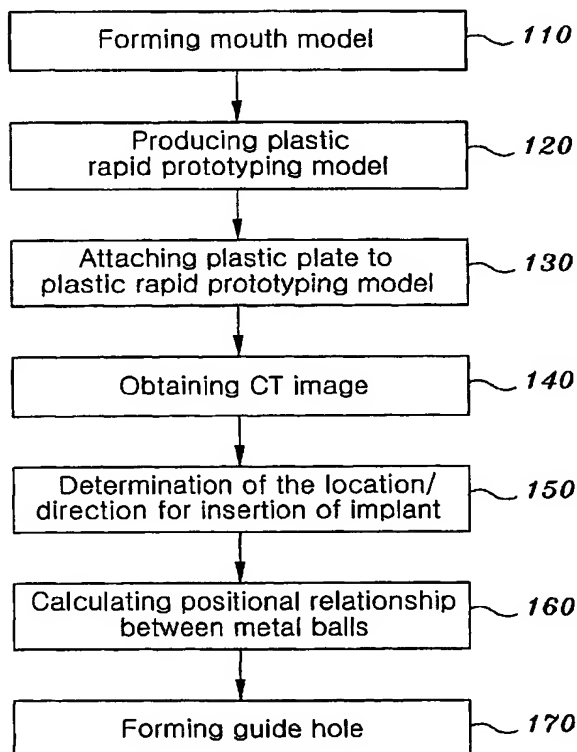
PCT

(10) International Publication Number
WO 2005/023138 A1

- (51) International Patent Classification⁷: **A61C 8/00**
- (21) International Application Number:
PCT/KR2004/002242
- (22) International Filing Date:
3 September 2004 (03.09.2004)
- (25) Filing Language: Korean
- (26) Publication Language: English
- (30) Priority Data:
10-2003-0061939 4 September 2003 (04.09.2003) KR
10-2004-0060621 30 July 2004 (30.07.2004) KR
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642-16 Yoksam-dong, Kangnam-ku, Seoul 135-080 (KR).
- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AI, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG,
MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH,
PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,

[Continued on next page]

(54) Title: STENT FOR GUIDING THE LOCATION/DIRECTION OF IMPLANT, AND PRODUCTION METHOD THEREOF



(57) Abstract: The present invention is disclosed a stent for guiding the location/direction for the insertion of an implant and a production method thereof. The method includes the steps of forming a plaster cast modeling of a mouth state using a plastic replica; and manufacturing a plastic cast model having an occlusal surface of the location for the insertion of the implant using the plaster cast; fastening a plastic plate having on corners thereof a plurality of metal balls to an upper end of the plastic cast model; and obtaining computed tomographic (CT) image of the mouth after placing the plastic cast model, on which the plastic plate is fastened, in the mouth, and forming a hole in a predetermined position in the stent to correspond to both a location and a direction of inserting the implant determined by a dentist based on the CT image.

WO 2005/023138 A1



ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

[Description]**[Invention Title]**

**STENT FOR GUIDING THE LOCATION/DIRECTION OF IMPLANT,
AND PRODUCTION METHOD THEREOF**

5 **[Technical Field]**

The present invention relates, in general, to devices for guiding the installation of implants and production methods thereof and, more particularly, to a guide model used for the insertion of an implant and a method of
10 producing a stent for guiding the location and direction for the insertion of an implant as determined by a dentist.

[Background Art]

Generally, in a dental implant operation to fill a region of a mouth where a patient is missing a tooth, it is
15 important to insert that the implant is installed at a stable and precise location and angle and to a precise depth. If damage to the root of an adjacent tooth occurs due to an implant being inserted in a wrong location, the damaged adjacent tooth must be undesirably removed. In
20 particular, the insertion of the implant must avoid anatomic structures, such as nervous tissue of a lower jaw and a maxillary sinus of an upper jaw or a lower jaw. Therefore, before the dental implant operation is executed, a determination of the location of safety for precisely
25 inserting of the implant must be conducted. As well, to

minimize the above-mentioned dangers, in the dental implant operation, a guide model for guiding the precise and stable location and direction for insertion of the implant has been used.

5 The guide model is called a stent. The stent means a plastic cast model capable of being fitted in the mouth of the patient. A method of producing a conventional stent for the implant and usage of the same are as follows:

10 1) The stent is produced to confirm a position suitable for insertion of an implant. The stent is produced using plastic material suitable and reproducible for a patient's tooth and gingiva, and it have the positioning material capable of the position such as metal ball, metal rod, filling material for endodontic treatment, and vacant
15 area on computed tomographic image.

 2) In the state in which the produced stent is mounted in the mouth of the patient, the CT images of the mouth(jaw including the stent, the position of missing tooth) are obtained. A positional relationship between the
20 indicating material and a jawbone is calculated using the obtained CT images. Thereafter, a guide hole is formed on the stent at the desired position and angle. The implant is installed in the jawbone through the guide hole of the stent.

25 However, in the above-mentioned dental implant operation, a dentist confirms the positional relationship between the indicating material and the jawbone observed in

the CT images with the naked eye prior to forming the guide hole on the stent at the desired and reevaluated position. As such, the manufacture of the stent and the use of the same depend only on the experience and senses of the dentist. Therefore, there is a probability of error occurring. As well, in the substantial implant operation, errors may also occur.

Background and conventional arts were disclosed in US Patent No. 5,927,982, No. 5,015,183, No. 5,133,660 and No. 5,967,777, and in Japan Laid-open Publication No. Heisei. 2003-88537.

A principle of each of the conventional arts disclosed in Japan Laid-open Publication No. Heisei. 2003-88537 and US Patent No. 5,927,982 is as follows. First, CT images of a jawbone including teeth are obtained. A three-dimensional image is obtained and, thereafter, a three-dimensional plastic rapid prototyping(RP) model modeling the jawbone is manufactured using data of the three-dimensional image. After the location of inserting the implant is determined based on the CT images, a guide hole is formed on the three-dimensional plastic rapid prototyping model according to the determined direction and angle.

However, in a process of manufacturing the plastic rapid prototyping model by reconstructing the CT images, the thickness for forming a section of the plastic rapid prototyping model is irregular (for example, the thickness

ranges from 0.5mm to 1mm). Thus, the accuracy of the manufactured plastic rapid prototyping model is reduced and, thereby the dental implant operation is unstable. Furthermore, to manufacture the plastic rapid prototyping model, a method in which powder is finely piled is used. In this process, an error in determining the insertion direction of the implant may occur. In addition, because the process of manufacturing the plastic rapid prototyping model is very complicated and requires special materials and expensive equipment, production costs are excessively increased.

[Disclosure]

[Technical Problem]

Accordingly, to solve the above problems occurring in the prior art, and an object of the present invention is to provide a stent which is capable of guiding the insertion of an implant as determined by a dentist, and a method of producing the same.

Another object of the present invention is to provide a stent and a method of producing the same which is simple and inexpensive.

[Description of Drawings]

FIG. 1 is a flow chart showing a method of producing a stent, according to an embodiment of the present invention;

FIG. 2 is a view showing an example of a mouth model;

FIG. 3 is a view showing a plastic plate of the present invention;

FIG. 4 is a sectional view showing a state in which
5 the plastic plate of FIG. 3 is fastened on a model of a region where a tooth is missing;

FIG. 5 is a view showing a CT image in which the stent of the present invention is displayed;

FIG. 6 is a view showing a CT image of metal balls of
10 the plastic plate shown in the CT image of FIG. 5;

FIG. 7 is a flow chart showing a process of manufacturing the stent for guiding the location/direction of an implant using the plastic plate of FIG. 3;

FIG. 8 is a flow chart showing a determination of the
15 location of inserting the implant in consideration of a spatial positional relationship between the metal balls described in FIG. 7; and

FIG. 9 is a view to visually show a positional relationship between the metal balls and the insertion
20 location of the implant described in FIG. 8.

[Best Mode]

In an aspect, the present invention provides a method of producing a stent for guiding the location/direction for the insertion of an implant, including the steps of:
25 forming a plaster cast modeling of a mouth state using a plastic replica; manufacturing a plastic cast model by

conventional dental material for stent such as resin having an occlusal surface of the location for the insertion of the implant using the plaster cast; fastening a plastic plate having on corners thereof a plurality of metal balls to an upper end of the stent; and obtaining a computed tomographic (CT) image of the mouth after placing the plastic cast model(stent), on which the plastic plate is fastened, in the mouth, and forming a hole on a predetermined position in the stent to correspond to both a location and a direction for the insertion of the implant determined by a dentist based on the CT image.

The determination of the location and direction (angle) for the insertion of the implant may depend on a spatial positional relationship between the metal balls displayed in the CT image.

The metal balls may comprise at least three metal balls.

Also, the method of producing the stent for guiding the location/direction for the insertion of the implant may further include a step of forming an implant guide hole on the plastic cast model(stent), on which the plastic plate is fastened, according to the predetermined location and direction.

The determination of the location and direction for the insertion of the implant may include the steps of determining positions of the metal balls from the obtained CT image; defining a plane provided by the metal balls

using the positions of the metal balls respectively; and calculating a relationship between the defined plane and an imaginary implant.

5 In another aspect, the present invention provides a stent for guiding the location/direction for the insertion of an implant, comprising: a plastic cast model having an occlusal surface of a predetermined portion into which the implant is inserted; a plastic plate having at least three metal balls and attached to the plastic cast model to be
10 parallel with each other; and an implant guide hole formed on a predetermined position of the plastic cast model corresponding to a hole determined according to a predetermined algorithm.

The predetermined algorithm may include the steps of
15 determining positions of the metal balls from an obtained computed tomographic (CT) image; defining a plane provided by the metal balls using the positions of the metal balls respectively; and calculating a relationship between the defined plane and an imaginary implant.

20 A further aspect, the present invention provides a method of determining a position of a guide hole of a stent for guiding the location/direction for the insertion of an implant, including the steps of: obtaining a computed tomographic (CT) image of a mouth after placing the stent
25 in the mouth; determining positions of the metal balls from the obtained CT image; defining a plane provided by the metal balls using the positions of the metal balls

respectively; and calculating a relationship between the defined plane and an imaginary implant.

The determination of the positions of the metal balls may include the steps of giving a number to each of the metal balls; defining a line, connecting metal ball number one to metal ball number two, as an X-axis, and defining another line, connecting metal ball number one to metal ball number three, as a Y-axis; confirming whether an angle between the two lines is perpendicular, and determining the determination of the positions of the metal balls to be in error if the angle between the two lines is not perpendicular, and defining a Z-axis by finding a vector product of the X-axis and the Y-axis if the angle between the two lines is the right angle, and measuring an insertion depth of the implant (I) based on the plane defined by the metal balls; and finding an intersection point (P) between an extension line of the implant (I) and a plane (S) formed by the X-axis and the Y-axis.

[Mode for Invention]

A principle of the present invention is that a mouth model having the same shape as a patient's mouth structure is provided by using a dental plastic replica, thus reducing production costs, and preventing an error from occurring during a dental implant operation. Furthermore, the present invention is provided the precise location and direction of a guide hole by using a plastic plate

including three or four metal balls. In an explanation of the metal balls, the number of the metal balls will be described as three or more, three or four, or four. That is, the plastic plate includes at least three metal balls.

5 FIG. 1 is a flow chart showing a method of producing a stent, according to an embodiment of the present invention.

Hereafter, the present invention will be explained with reference to FIG. 1.

10 At step 110, a mouth model is formed. The mouth model is made of a dental plastic replica. A plaster cast modeling the mouth including a region for an implant insertion is formed. An example of the plaster cast is shown in FIG. 2.

15 At step 120, an engraved plastic cast model or conventional stent without indicating material having an occlusal surface of the region (A) of inserting the implant is manufactured on the plaster cast. Here, because a shape of the mouth of the patient is reproduced without error,
20 the plastic cast model can be in precisely close contact with the teeth of the patient.

At step 130, a plastic plate is placed on the plastic cast model to be parallel to a horizontal axis of the plastic cast model. Thereafter, the plastic plate is firmly
25 fastened to the plastic cast model by a resin material. At this time, the plastic plate has very small metal balls (preferably, about 1mm diameter balls) on corners thereof.

The size of the metal balls may be standardized.

An example of the plastic plate having the metal balls is shown in FIG. 3. FIG. 4 is a side view of the plastic cast model on which the plastic plate having the metal balls is fastened. In FIG. 4, the reference numeral 410 is plastic plate and the reference numeral 430 is the plastic cast model having the occlusal surface of the location (A) of inserting the implant.

At step 140, the plastic cast model, on which the plastic plate is fastened, is placed in the mouth. Thereafter, a computed tomographic (CT) image of the mouth is obtained. As such, the obtained CT image is shown in FIG. 5. Here, to display the CT image, the well-known three-dimensional digital medical image information processing system is used.

At step 150, a dentist determines a location and a direction of inserting the implant by using the CT image. Thereafter, as step 160, a spatial positional relationship between the four metal balls and an axis in the insertion direction of the implant determined by the dentist is calculated. In detail, information about an intersection point and angle between an extension line of the insertion axis of the implant determined from the CT image and a plane formed by connecting centers of three or four metal balls is obtained. At this time, the metal balls are used as a means to express a direction for the insertion of the implant as numerical values and to form a hole on the stent

using the confirmed numerical values. As such, when the plastic plate having the three or four metal balls on the corner is used, only metal balls are displayed on the CT image as shown in FIG. 6. By using this CT image, the spatial and positional relationship between the metal balls and the location and the direction for insertion of the implant determined by the dentist can be easily and precisely calculated.

A standardization method of the three or four metal balls used in the present invention becomes a basis of various dental operations to be executed in the mouth. This technique may be used in various fields as well as the present invention.

Finally, as step 170, the hole is formed using a drill on a predetermined position in the stent to correspond to both the location and the direction for insertion of the implant calculated in step 160.

As described above, the plastic plate having the three or four metal balls is useful in the automation of dental operations to be executed in the mouth. In other words, when the plastic plate having the metal balls is used, it is possible to conveniently and precisely obtain various data. Furthermore, the plastic plate having the metal balls serves as a fiducial point for a dental surgical operation. For example, numerical values are obtained from the metal balls and the obtained numerical values are calculated using a robot. The calculated

numerical values can be used as spatial indicators in the case of a dental treatment or surgical operation. A method of producing the stent for precisely guiding the location/direction for the insertion of the implant for a dental surgical operation in the mouse using the plastic plate according to the present invention is shown in FIG. 7.

Referring to FIG. 7, at step 710 a size of the plastic plate suitable for a dental surgical region in a patient's mouth is determined. At step 730, the plastic plate of the determined predetermined size, which has at least three metal balls on corners thereof, is placed on the dental surgical region in the patient's mouth. At step 750, a computed tomographic (CT) image of the mouth, in which the plastic plate is placed, is obtained. At step 770, a guide hole is formed using a spatial positional relationship between the metal balls confirmed from the CT image. At step 730, the plastic plate is used as a spatial indicator. Therefore, preferably, an assistant model, such as the plastic cast model 430, is placed along with the plastic plate on the dental surgical region.

There is the following difference between the implant guide stent of the present invention and a conventional technique disclosed in US Patent No. 5,967,777. In claim 1 of the US Patent, the use of a radiopaque fiducial marker is proposed. However, the radiopaque fiducial marker is directly attached to a plastic replica after a position to

be attached to a plane is computed, as shown in FIG. 5 of US Patent No. 5,967,777. In comparison with this, in the present invention, the metal balls are previously placed on the planar plastic plate as shown in FIG. 3, and
5 thereafter, the plastic plate having the metal balls is attached to the dental plastic replica. In addition, the present invention does not require the process shown in FIG. 5 of US Patent No. 5,967,777. Furthermore, in US Patent No. 5,967,777, a separate pin must be tightened into
10 a lower part of the radiopaque fiducial marker to fasten the radiopaque fiducial marker to a predetermined position during a drilling process, as shown in FIG. 10. In other words, it is necessary that a separate device be mounted on an existing CNC milling machine. However, in the implant
15 guide stent of the present invention, because the planar plastic plate is used, the stent is easily fastened in the CNC milling machine. Therefore, the guide hole can be simply formed on the stent without a separate fastening device.

20 FIG. 8 is a flow chart showing a determination of the insertion location for the insertion of the implant in consideration of the spatial positional relationship between the metal balls described in FIG. 7. FIG. 9 is a view to visually show the method of determining the
25 insertion location of the implant. Here, the insertion location of the implant means a position of the guide hole formed on the implant guide stent including the plastic

plate.

Referring to FIG. 8, at step 810, positions of the metal balls from the obtained CT image are determined. At step 820, a plane provided by the metal balls using the positions of the metal balls is defined. At step 830, a relationship between the defined plane and an imaginary implant is calculated.

The step 810 includes a process of extracting CT scan data higher than CT scan values of alveolar bone around the metal balls, a process of separating only the CT scan data of metal balls from the obtained CT scan data, and a process of calculating the coordinates of centers of the metal balls. At this time, the CT scan values of the metal balls are higher than those of normal anatomic structures. On the basic of this, the separation of the data means that all structures except for the metal balls are expressed in black, when data having value higher than a predetermined CT scan value is extracted.

The step 820 includes a process of giving a number (for example number one, number two and number three) to each of the metal balls, and a process of defining a line, connecting metal ball number one to metal ball number two, as an X-axis, and defining another line, connecting metal ball number one to metal ball number three, as a Y-axis. The step 820 further includes a process of confirming whether an angle between the two lines is a right angle, and a process of determining the positions of the metal

balls to be in error if the angle between the two lines is not the right angle, and defining a Z-axis by finding a vector product of the X-axis and the Y-axis if the angle between the two lines is the right angle. The step 820
5 further includes a process of finding an intersection point (P) between an extension line of the implant (I) and a plane (S) formed by the X-axis and the Y-axis.

The step 830 includes a process of transforming the intersection point (P) as values of plane coordinates
10 (except for the Z-axis), a process of calculating an angle (A) between the implant (I) and the X-axis; and a process of calculating an angle (B) between the implant (I) and the Y-axis, and a process (C) of measuring an insertion depth of the implant (I) in consideration of the length of the
15 implant (I) based on the plane defined by the metal balls.

Using the above-mentioned processes, the present invention simply and precisely obtains the location (P) for insertion of the implant using the coordinates calculation.

A stent for guiding the location/direction for the
20 insertion of an implant produced through the above-mentioned stent production method is shown in FIG. 10. Referring to FIG. 10, the implant guide stent includes a plastic cast model 430 having an occlusal surface of a predetermined portion into which the implant is inserted, a
25 plastic plate 410 which has at least three metal balls b1, b2 and b3 and is attached to the plastic cast model to be parallel with it, and an implant guide hole (H) which is

formed in a predetermined position (P) of the plastic cast model corresponding to a hole determined according to a predetermined algorithm, that is, the steps described in FIG. 8.

5 In the implant guide stent of FIG. 10, a distance 'd' between the metal ball b1 and the metal ball b2 is preferably the same as the width of a junction surface between the plastic cast model 430 and the plastic plate 410.

10 Although the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the
15 invention as disclosed in the accompanying claims. For example, an implant guide stent, which is produced according to the conventional technique, and on which the plastic plate having the metal balls according to the present invention is placed, can be regarded as falling
20 within the scope of the present invention. As well, the calculation of the location of the implant using a computed is very important factor in the manufacture and application of the implant guide stent of the present invention. Therefore, elements that relate to a method of determining
25 the position and the direction of the guide hole formed in the implant guide stent using predetermined software or other methods can also be regarded as falling within the

scope of the present invention.

As such, the scope of the present invention is not confined to the disclosed preferred embodiment, but must be decided within the bounds of the accompanying claims of the present invention, or within elements to be embraced by the claims.

[Industrial Applicability]

As described above, the present invention uses a natural model modeling a mouth state of a patient, so that a precise and stable stent can be produced. Furthermore, because a guide hole is formed in the stent in a desired direction by a dentist, an implant insertion operation reflecting the opinion of the dentist can be executed.

In addition, the present invention does not require expensive materials or devices, thus simplifying production, and reducing production costs. As well, in the present invention, a CT image is obtained using a plastic plate having three or four metal balls, and the location and direction for insertion of the implant are determined using the obtained CT image. Thus, the implant can be inserted at the precise location and angle. Moreover, the present invention obtains the CT image using the plastic plate having three or four metal balls, and the guide hole is formed in a predetermined position of the stent to correspond to both a location and a direction for insertion of the implant determined by the dentist based on the

obtained CT image. Accordingly, the dentist can insert the implant at a precise location and in a precise direction.

[CLAIMS]**[Claim 1]**

A method of producing a stent for guiding the location/direction for the insertion of an implant,
5 comprising the steps of:

forming a plaster cast modeling of a mouth state using a plastic replica;

manufacturing a plastic cast model having an occlusal surface of the location for the insertion of the implant
10 using the plaster cast;

fastening a plastic plate having on corners thereof a plurality of metal balls to an upper end of the plastic cast model; and

obtaining a computed tomographic (CT) image of the
15 mouth after placing the plastic cast model, on which the plastic plate is fastened, in the mouth, and forming a hole on a predetermined position in the stent to correspond to both a location and a direction for the insertion of the implant determined by a dentist based on the CT image.

20 [Claim 2]

The method of producing the stent for guiding the location/direction for the insertion of the implant according to claim 1, wherein the determination of the location and direction for the insertion of the implant
25 depends on a spatial positional relationship between the metal balls displayed in the CT image.

【Claim 3】

The method of producing the stent for guiding the location/direction for the insertion of the implant according to claim 1, wherein the metal balls comprise at least three metal balls.

【Claim 4】

The method of producing the stent for guiding the location/direction for the insertion of the implant according to claim 1, further comprising a step of:

10 forming an implant guide hole on the plastic cast model, on which the plastic plate is fastened, according to the predetermined location and direction.

【Claim 5】

The method of producing the stent for guiding the location/direction for the insertion of the implant according to claim 2, wherein the determination of the location and direction for insertion of the implant comprises the steps of:

determining positions of the metal balls from the obtained CT image;

20 defining a plane provided by the metal balls using the positions of the metal balls respectively; and

calculating a relationship between the defined plane and an imaginary implant.

【Claim 6】

A stent for guiding the location/direction for the insertion of an implant produced by the method according to any one of claims 1 through 5.

5 **【Claim 7】**

A stent for guiding the location/direction for the insertion of an implant, comprising:

a plastic cast model 430 having an occlusal surface of a predetermined portion into which the implant is
10 inserted;

a plastic plate 410 having at least three metal balls (b1,b2,b3) and attached to the plastic cast model to be parallel with each other; and

an implant guide hole (H) formed on a predetermined
15 position (P) of the plastic cast model corresponding to a hole determined according to a predetermined algorithm.

【Claim 8】

The stent for guiding the location/direction for the insertion of the implant according to claim 7, wherein the
20 predetermined algorithm comprises the steps of:

determining positions of the metal balls from an obtained computed tomographic (CT) image;

defining a plane provided by the metal balls using the positions of the metal balls respectively; and

calculating a relationship between the defined plane and an imaginary implant.

【Claim 9】

A method of determining a position of a guide hole of
5 a stent for guiding the location/direction for the
insertion of an implant, the stent having a plastic cast
model 430 having an occlusal surface of a predetermined
portion into which the implant is inserted; and a plastic
plate 410 having at least three metal balls (b1,b2,b3) and
10 attached to the plastic cast model to be parallel to each
other, the method comprising the steps of:

obtaining a computed tomographic (CT) image of a
mouth after placing the stent in the mouth;

determining positions of the metal balls from the
15 obtained CT image;

defining a plane provided by the metal balls using
the positions of the metal balls respectively; and

calculating a relationship between the defined plane
and an imaginary implant.

20 **【Claim 10】**

The method of determining the position of the guide
hole of the stent for guiding the location/direction for
the insertion of the implant according to claim 9, wherein
the determination of the positions of the metal balls
25 comprises the steps of:

giving a number to each of the metal balls;

defining a line, connecting metal ball number one to metal ball number two, as an X-axis, and defining another line, connecting metal ball number one to metal ball number three, as a Y-axis;

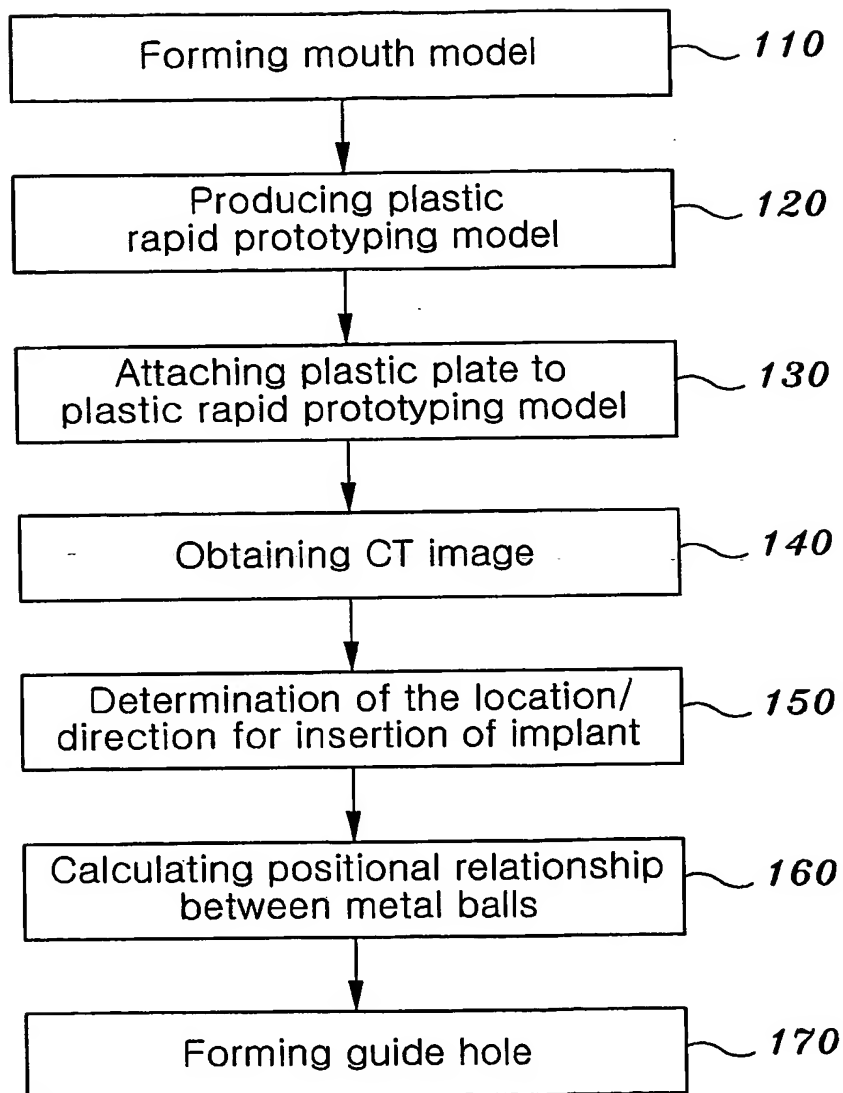
5 confirming whether an angle between the two lines is perpendicular, and determining the positions of the metal balls to be in error if the angle between the two lines is not perpendicular, and defining a Z-axis by finding a vector product of the X-axis and the Y-axis if the angle
10 between the two lines is perpendicular; and measuring an insertion depth of the implant (I) based on the plane defined by the metal balls; and

finding an intersection point (P) between an extension line of the implant (I) and a plane (S) formed by
15 the X-axis and the Y-axis.

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FIGURES

FIG. 1



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FIG. 2

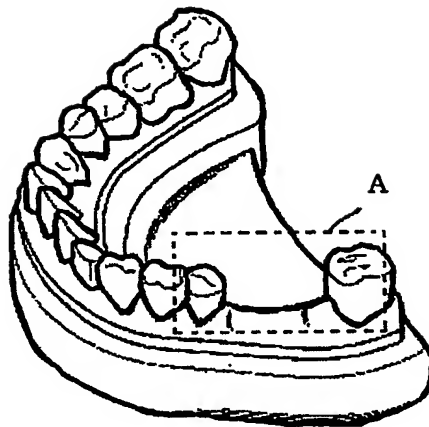
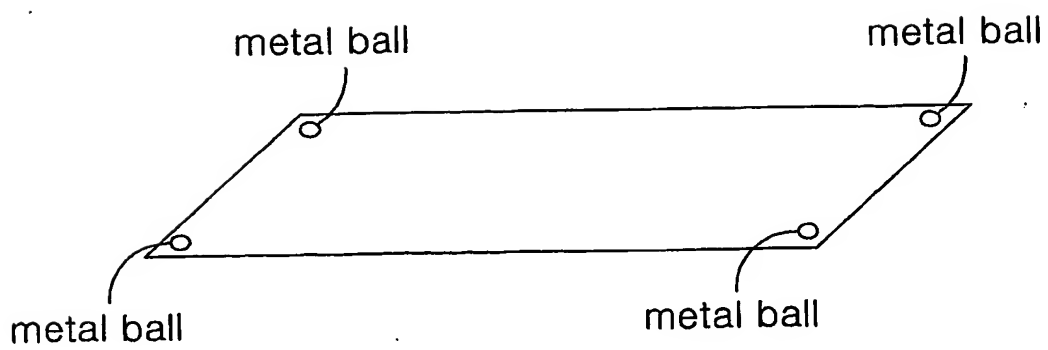


FIG. 3



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FIG. 4

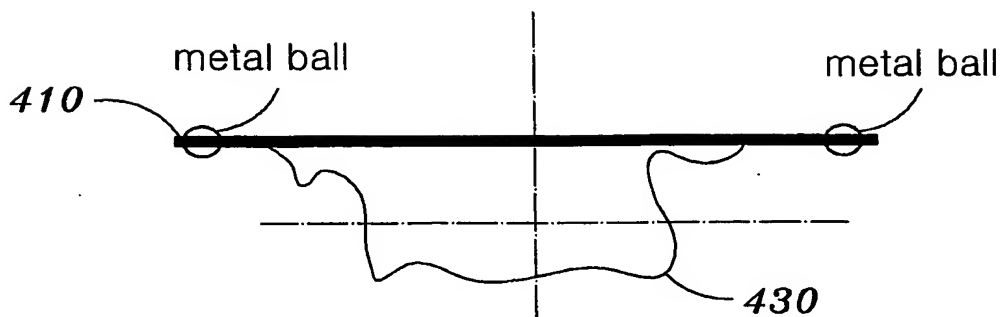
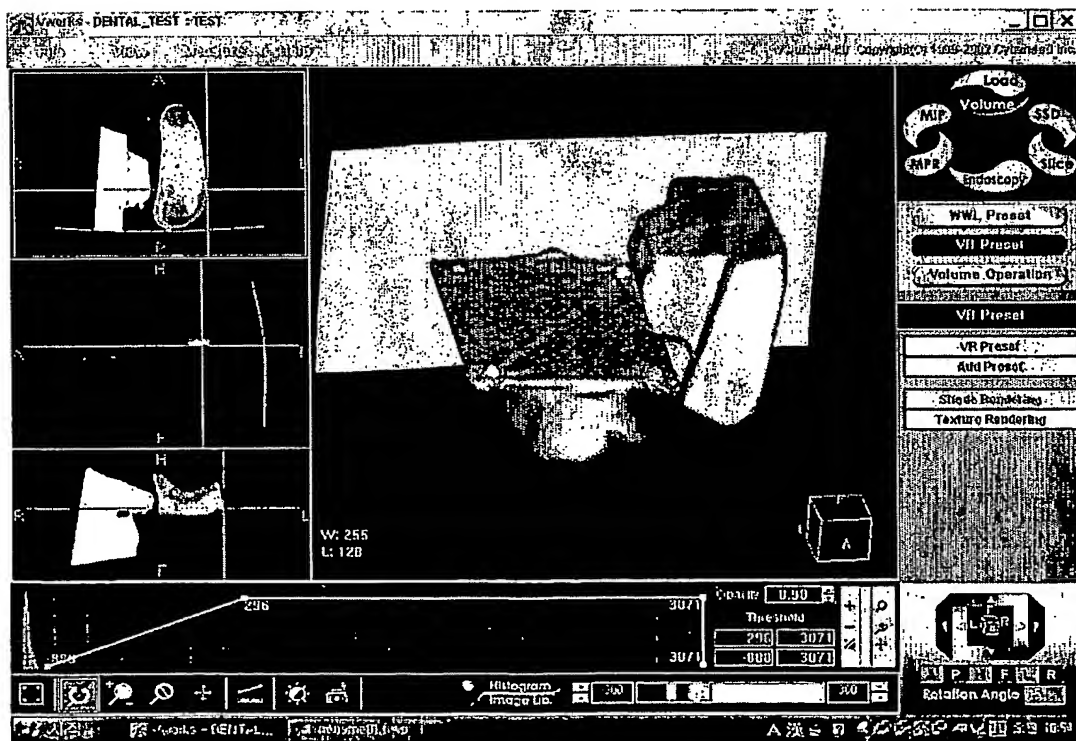


FIG. 5



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FIG. 6

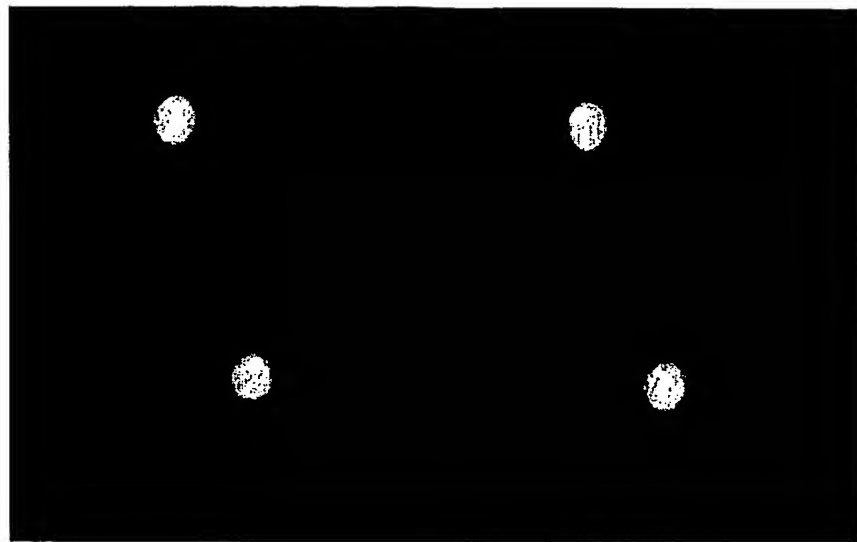
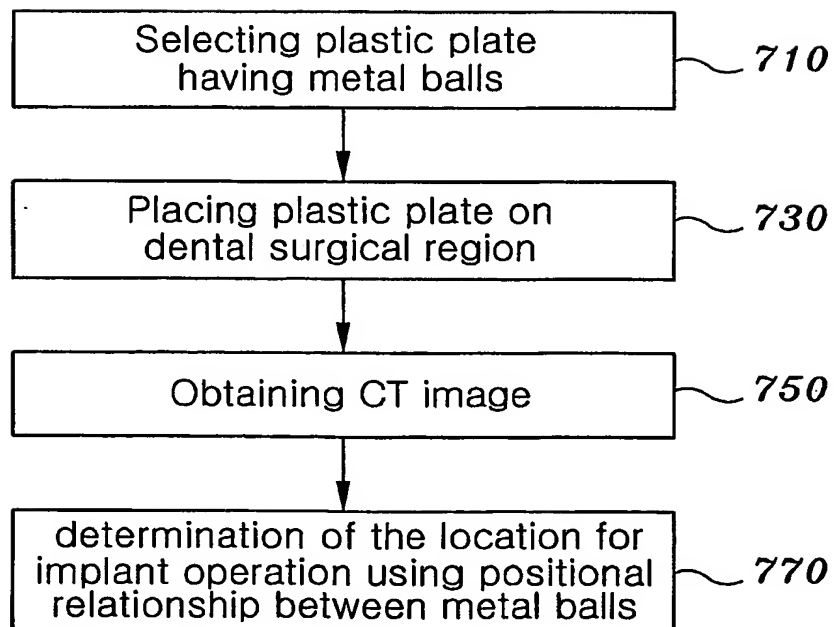
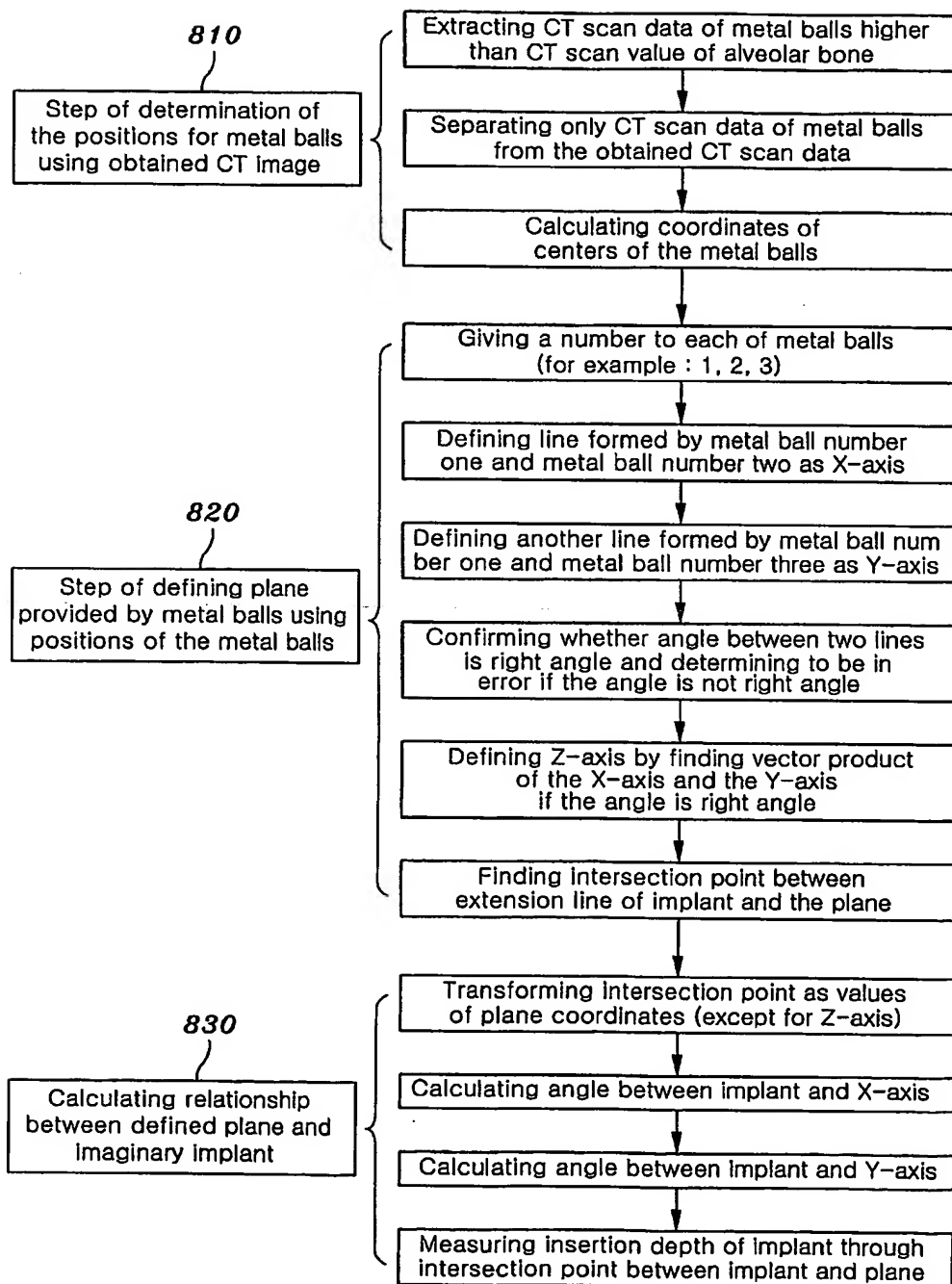


FIG. 7



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FIG. 8



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FIG. 9

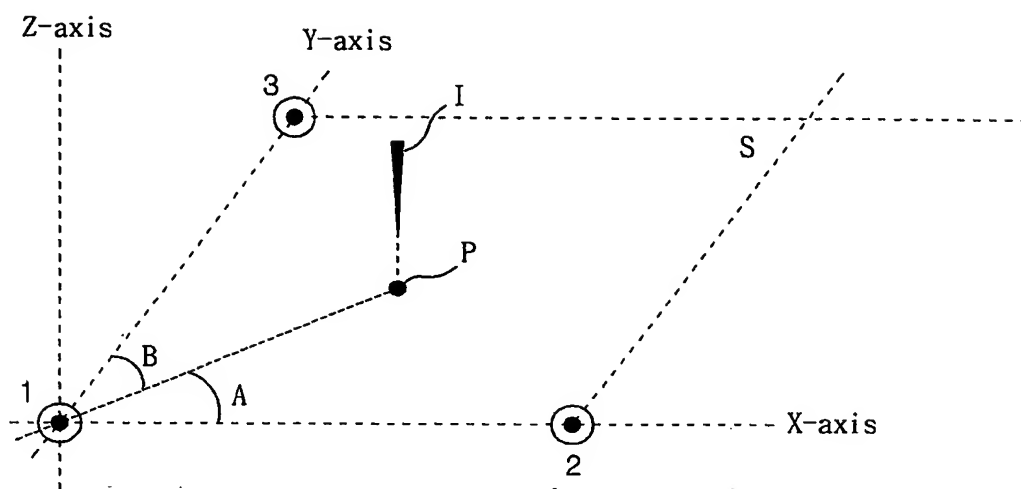
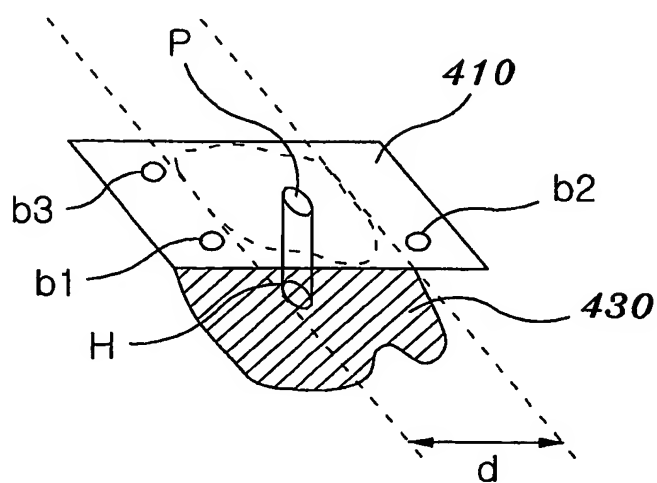


FIG. 10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2004/002242

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 A61C 8/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 A61C 3/02, 9/00, 19/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PAJ, E-KIPASS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2003-245289 A (UNIV NIHON ET AL) 2 SEPTEMBER 2003 See patent abstract	7
A	US 5823778 A (STEPHEN M. SCHMITT ET AL) 20 OCTOBER 1998 See the whole document	7
A	US 5967777 A (MICHAEL KLEIN ET AL) 19 OCTOBER 1999 See the whole document	7
A	US 5320529 A (DANIEL G. POMPA) 14 JANUARY 1994 See claims	7

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 JANUARY 2005 (18.01.2005)

Date of mailing of the international search report

18 JANUARY 2005 (18.01.2005)

Name and mailing address of the ISA/KR



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Authorized officer

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2004/002242

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 1-6, 9-10
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 1-6 and 9-10 pertain to methods for treatment of the human body by therapy, and thus relate to a subject matter which this International Searching Authority is not required, under Article 17(2)(a)(i) of the PCT and Rule 39.1(iv) of the Regulations under the PCT, to search.
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2004/002242

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2003-245289 A	02.09.03	NONE	
US 5823778 A	20.10.98	NONE	
US 5967777 A	19.10.99	NONE	
US 5320529 A	14.01.94	NONE	